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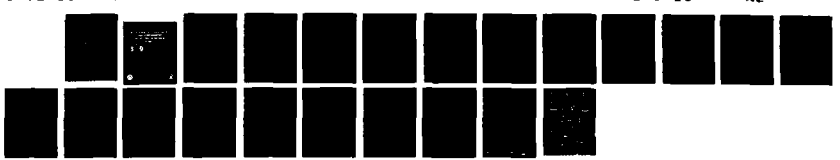

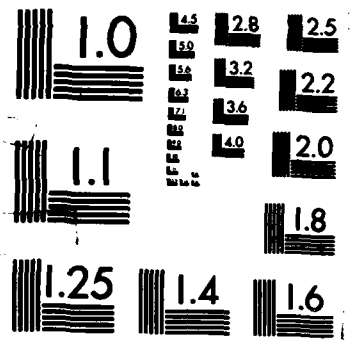
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BEHAVIORAL, PSYCHOLOGICAL, AND DEMOGRAPHIC PREDICTORS OF PHYSICAL FITNESS

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Behavioral, Psychological, and Demographic Predictors of Physical Fitness

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TABLE OF CONTENTS

Summary 2

Methods 4

Participants 4

Measures 4

Physical Fitness 4

Self-Reported Survey Measures 5

Behavioral Variables 5

Psychological Variables 6

Background Variables 6

Results 6

Table 1: Predictors of Better 1.5-Mile Run Performance 7

Table 2: Predictors of Sit-up Test Performance 8

Table 3: Predictors of Sit-Reach Flexibility 9

Table 4: Predictors of Percent Body Fat 10

Table 5: Predictors of Higher Overall Physical Fitness 11

Discussion 12

References 14

Appendix A: Listing of the Items in the Three Health Behaviors Scales ... 16

Appendix B: Zero-Order Correlations between the Physical Fitness Measures and Behavioral, Psychological, and Background Predictors 18

SUMMARY

Problem

Achieving higher levels of physical fitness has become a goal of many Americans both for personal reasons (e.g., improved health, appearance, and perceived well-being) and for organizational reasons (e.g., corporate cost-savings with healthy employees; operational readiness for the military services). Understanding the factors which relate to physical fitness could suggest interventions which are more effective in helping people improve their fitness levels.

Objective

The purpose of this study was to determine the associations between a variety of behavioral, psychological, and background factors and four components of physical fitness: (a) cardiorespiratory endurance (1.5-mile run), (b) muscular endurance (sit-ups), (c) flexibility (sit-and-reach test), and (d) body composition (estimated percent body fat).

Approach

Physical fitness test scores and "lifestyle" surveys were collected from 1,357 Navy men stationed aboard nine ships whose home port was San Diego. Multiple regression analyses were computed to determine the best independent predictors of each of the four components of physical fitness as well as an overall fitness measure.

Results

Controlling for exercise activities, physical fitness was positively associated with "wellness" behaviors (e.g., "watch my weight;" "take vitamins"), believing that it is important to be physically fit, expecting to reach/maintain ideal weight, being athletic as a youth, and years of schooling; fitness was negatively associated with tobacco use, "preventive/avoidance" behaviors (e.g., "avoid getting chilled;" "have first aid kit in home"), age, and ever being overweight.

Conclusions

These findings indicate the types of factors that are related to physical fitness above and beyond the reported exercise one gets. Such information might be useful for structuring better interventions and fitness programs tailored to the individual.

Behavioral, Psychological, and Demographic Predictors of Physical Fitness

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Over the last several decades there has been a substantial increase in concern about healthful lifestyles in general and physical fitness in particular. This has been evident in both the public and private sectors (Fielding, 1984; Green, 1984). As early as the 1950's, government commissions were examining the issue of fitness among the Nation's youth, and programs were being developed to encourage physical fitness in school children (Hackett, Walters, and Leslie, 1983). By the late 1970's there had been a substantial increase in the number of people engaging in activities geared toward improving physical fitness (Powell & Paffenbarger, 1985; Stephens, Jacobs, & White, 1985). Big and small businesses now promote the availability of corporate health promotion activities as a fringe benefit (Rosen & Freedman, 1987; Behrens, 1985). Exercise clubs and sporting goods stores have sprung up everywhere. Warm-up suits and running shoes have become fashionable. Exercising to be physically fit has become accepted as an important component of overall health by millions of people.

Achieving good levels of physical fitness has become a goal of many both for personal reasons (e.g., improved health, appearance, and perceived well-being) and for organizational reasons (e.g., corporate cost-savings with healthy employees; operational readiness for the military services). Understanding the factors which have an impact on physical fitness could help people improve their fitness levels. Exercise activities certainly should have an impact on one's level of physical fitness. Yet, there are undoubtedly other behaviors (e.g., smoking; see Conway & Cronan, in press) which influence physical fitness. A variety of psychological variables such as values and attitudes towards physical fitness also might have an impact by influencing whether or not a person undertakes a fitness program or engages in other health-related behaviors (Dishman, Sallis, & Orenstein, 1985). Certain background variables might also limit or enhance the degree of physical fitness a person can achieve (e.g., athletic activities as a youth). The purpose of this study was to examine a variety of behavioral, psychological,

and background factors to determine which had a significant impact on four components of physical fitness.

METHODS

Participants

Participants were 1,357 Navy men stationed aboard nine ships in the San Diego area. These men were participants in a larger study examining physical readiness among Navy personnel during 1984 (Conway & Dutton, 1985). The average age of the participants was 26.0 years (SD = 6.2) with a range from 18-51 years of age. Average number of years of schooling completed was 12.5 years (S.D. = 1.5), ranging from 8 to 20 years. Of 1,152 men who specified their race/ethnic group, 79% were Caucasian, 9% were Black, 5% were Hispanic/Puerto Rican, 4% were Malayan, 2% were Filipino, and 1% were of other race/ethnic groups. The median paygrade was E-4. Enlisted personnel comprised 93% and officers 7% of the sample, which slightly overrepresents enlisted personnel relative to the 88% found in the Navy at large (Naval Military Personnel Command, 1984). No female sailors were included in this study because only 3 of 90 San Diego-based ships had women assigned to them, and none of these ships became part of the group studied.

Measures

Physical Fitness. During 1984, the Physical Readiness Test (PRT) was required annually as part of the Navy's Health and Physical Readiness Program (Chief of Naval Operations, 1982). The PRT assessed four components of physical fitness which included the following: (a) 1.5-mile run (stamina and cardiorespiratory endurance): time to run/walk 1.5 miles on a relatively flat, smooth surface; (b) sit-ups test (muscular endurance): number of bent-knee sit-ups done in a 2-minute period; (c) sit-reach test (flexibility): person sitting on floor with knees straight reaches as far forward as possible and touches the ground between legs; distance stretched beyond the heels scored as positive inches, and those short of the heels as negative inches; (d) body composition (estimated percent body fat): computed from an equation using two body circumferences: (i) neck circumference, measured around the neck with the tape passing just below the larynx, and (ii) abdominal circumference, measured around the abdomen at the level of the umbilicus (Wright, Dotson, & Davis, 1981). An additional measure indicating overall physical fitness

was computed by averaging the z-scores for each of the four components of the PRT. Prior to computing this average, the signs of the z-scores for 1.5-mile run times and for the percent body fat estimates were reversed so that positive scores on all PRT components indicated better physical fitness.

Self-Reported Survey Measures. Participants completed self-report surveys asking about a variety of health- and fitness-related behaviors, attitudes, values, and perceptions, as well as background and demographic items. The variables examined in this report were grouped into three general categories: behavioral, psychological, and demographic/background.

Behavioral Variables: Seven behavioral variables were derived from self-reports about behaviors involving exercise habits, substance consumption, and a variety of general health behaviors. Two components for each of eight exercises (running, walking, swimming, bicycling, racket sports, aerobics, weight lifting and calisthenics) were assessed: (a) frequency (i.e., times per week or month an exercise was done), and (b) duration (i.e., time spent exercising during a workout period). An exercise activity scale was computed as the sum of the frequency-by-duration cross-product for each exercise.

Substance consumption measures were self-reports about smoking, caffeine consumption, and alcohol consumption. The average amount of tobacco smoked per day was indicated on a 10-category response scale: 0, 1-5, 6-10, 11-15, 16-20, 21-25, 26-30, 31-35, 36-40, and 41+ of cigarettes, cigars, and/or pipefuls of tobacco smoked per day. Respondents answered three separate questions concerning the average number of caffeinated cups of coffee, cups or glasses of tea, and soft drinks consumed per day; responses were summed to estimate the average number of caffeinated drinks consumed per day. An estimate of weekly alcohol consumption was calculated by multiplying the reported number of days on which the respondent drank alcohol by the usual number of drinks taken on those days.

Responses reflecting the practice of 44 other health behaviors were averaged for three additional scales: (a) "wellness" behaviors (11 items such as "watch my weight;" "take vitamins") (alpha = .78), (b) "preventive/avoidance" behaviors (21 items such as "have first aid kit in home;" "avoid getting chilled") (alpha = .83), and "risk-taking" behaviors (12 items such as "do risky things that are fun/exciting;" "take chances

crossing the street") (alpha = .79). Items used in these scales were taken from health behavior questionnaires developed by Vickers and Hervig (cf. Vickers & Hervig. 1984). The specific items used in this study and their scale groupings are shown in Appendix A.

Psychological Variables: Nine variables reflecting beliefs and values regarding health and fitness included the following: (a) 5-item scale on the importance of physical fitness, including items on regular exercise, weight control, and scoring high on the physical fitness tests (alpha = .88); (b) 2-item scale on the importance of good health (alpha = .90); (c) 6-item scale reflecting beliefs that exercise would lead to valued outcomes--scale score was the sum of the cross-products of the importance (rated on a 5-point scale) of an outcome times the correspondent instrumentality rating (from 0 to 100) that exercise would produce the outcome (alpha = .93); (d) 2-item scale reflecting expectations about reaching and/or maintaining one's ideal weight over the next year (alpha = .86); (e) 2-item scale regarding expectations about stopping smoking and/or remaining a non-smoker over the next year (alpha = .95); (f) 2-item scale regarding expectations about exercising regularly over the next year (alpha = .91); and (g) three single items on the importance of stopping smoking and/or remaining a non-smoker, of being physically attractive to others, and of doing one's job well.

Background Variables: The six variables examined were: (a) current age, (b) years of schooling, (c) 2-item scale on whether the participant was overweight as a child and adolescent (alpha = .89), (d) 2-item scale on how athletic the person was as a child and adolescent (alpha = .91), (e) 2-item scale on whether one had ever had a weight problem (alpha = .62), and (f) a single item about other blood relatives having an overweight problem.

RESULTS

Multiple regression analyses were computed to determine the best predictors of each of the four components of physical fitness as well as overall fitness (i.e., the average of these components). Because exercise should be a primary determinant of physical fitness, the exercise activities scale was forced to enter the equation first. All other variables were allowed to enter the equation in a forward stepwise manner. This procedure made it possible to determine factors which uniquely

predicted the physical fitness measures above and beyond the exercise a person reported. Of the 22 variables examined, 11 entered as significant ($p < .05$) predictors of at least one of the four components of physical fitness. These 11 variables are noted on all five tables which follow. All zero-order correlations between the physical fitness measures and the 22 predictor variables are provided in Appendix B.

As shown in Table 1, better performance on the 1.5-mile run was significantly predicted ($R = .59$) by seven variables after controlling for exercise activities--three in a positive direction (self-rating of the importance of physical fitness, years of schooling, and being athletic as a youth) and four in a negative direction (average amount smoked per day, the preventive/avoidance health behaviors scale, age, and self-rating of ever being overweight).

Table 1

Predictors of Better 1.5-Mile Run Performance

	B	Beta
Behavioral		
Exercise Activities [Forced 1st into equation]	.01	.06 ns
Tobacco Use (amount smoked per day)	-.13	-.16 **
Wellness Behaviors	---	---
Preventive/Avoidance Behaviors	-.45	-.12 *
Risk-Taking Behaviors	---	---
Psychological		
Importance of Physical Fitness	.63	.27 ***
Expect to Reach/Maintain Ideal Weight	---	---
Background		
Age	-.11	-.33 ***
Education	.20	.14 **
Athletic as a Youth	---	.11 *
Ever Overweight	-.61	-.20 ***
Overweight as a Youth	---	---
Constant	11.85	
Multiple R:		.59
Variance accounted for:		34.2%

* $p < .05$ ** $p < .01$ *** $p < .001$

After controlling for exercise activities, the number of sit-ups a person could do was predicted significantly (R =.54) by five variables (see Table 2)--three in a positive direction (the wellness health behaviors scale, the risk-taking behaviors scale, and believing in the importance of physical fitness) and two in a negative direction (tobacco use and age).

Table 2

Predictors of Sit-up Test Performance

	B	Beta
Behavioral		
Exercise Activities [Forced 1st into equation]	.12	.09 ns
Tobacco Use (amount smoked per day)	-.77	-.13 *
Wellness Behaviors	3.29	.14 *
Preventive/Avoidance Behaviors	---	---
Risk-Taking Behaviors	2.67	.11 *
Psychological		
Importance of Physical Fitness	4.51	.26 ***
Expect to Reach/Maintain Ideal Weight	---	---
Background		
Age	-.49	-.19 ***
Education	---	---
Athletic as a Youth	---	---
Ever Overweight	---	---
Overweight as a Youth	---	---
Constant	32.33	
Multiple R:		.54
Variance accounted for:		29.6%

* p < .05 ** p < .01 *** p < .001

After controlling for exercise activities, sit-reach flexibility was significantly predicted (R =.32) by three variables (see Table 3)--two in a positive direction (believing in the importance of physical fitness and expecting to reach and/or maintain one's ideal weight over the next year) and one in a negative direction (age).

Table 3

Predictors of Sit-Reach Flexibility

	B	Beta
Behavioral		
Exercise Activities [Forced 1st into equation]	.01	.04 ns
Tobacco Use (amount smoked per day)	---	---
Wellness Behaviors	---	---
Preventive/Avoidance Behaviors	---	---
Risk-Taking Behaviors	---	---
Psychological		
Importance of Physical Fitness	.51	.15 *
Expect to Reach/Maintain Ideal Weight	.57	.17 **
Background		
Age	-.06	-.11 *
Education	---	---
Athletic as a Youth	---	---
Ever Overweight	---	---
Overweight as a Youth	---	---
Constant	.26	
Multiple R:		.32
Variance accounted for:		10.4%

* p < .05 ** p < .01 *** p < .001

As shown in Table 4, higher levels of estimated percent body fat were significantly predicted (R =.63) by five variables after controlling for exercise activities--four in a positive direction (the preventive/avoidance behaviors scale, age, self-rating of ever being overweight, and being overweight as a child and adolescent) and one in a negative direction (the wellness health behaviors scale).

Table 4

Predictors of Percent Body Fat

	B	Beta
Behavioral		
Exercise Activities [Forced 1st into equation]	-.00	-.01 ns
Tobacco Use (amount smoked per day)	---	---
Wellness Behaviors	-1.44	-.20 **
Preventive/Avoidance Behaviors	1.03	.12 *
Risk-Taking Behaviors	---	---
Psychological		
Importance of Physical Fitness	---	---
Expect to Reach/Maintain Ideal Weight	---	---
Background		
Age	.13	.17 ***
Education	--	--
Athletic as a Youth	---	---
Ever Overweight	3.33	.49 ***
Overweight as a Youth	.80	.13 *
Constant	7.35	
Multiple R:		.63
Variance accounted for:		39.8%

* p < .05 ** p < .01 *** p < .001

Table 5 presents the regression results when predicting the average (see Methods) of the four separate components of the PRT. These results provide a good indication of the factors which have independent significant associations with overall fitness level. After controlling for exercise activities, higher overall physical fitness was significantly predicted (R =.69) by nine variables--five in a positive direction (the wellness health behaviors scale, believing in the importance of physical fitness, expecting to reach/maintain one's ideal weight over the next year, years of schooling, and being athletic as a child and adolescent) and four in a negative direction (tobacco use, the preventive/avoidance health behaviors scale, age, and self-rating of ever being overweight).

Table 5

Predictors of Higher Overall Physical Fitness

	B	Beta
Behavioral		
Exercise Activities [Forced 1st into equation]	.00	.06 ns
Tobacco Use (amount smoked per day)	-.02	-.10 *
Wellness Behaviors	.17	.17 **
Preventive/Avoidance Behaviors	-.21	-.18 **
Risk-Taking Behaviors	---	---
Psychological		
Importance of Physical Fitness	.15	.20 ***
Expect to Reach/Maintain Ideal Weight	.08	.11 *
Background		
Age	-.03	-.31 ***
Education	.04	.10 *
Athletic as a Youth	.05	.09 *
Ever Overweight	-.29	-.31 ***
Overweight as a Youth	---	---
Constant	-.29	
Multiple R:		.69
Variance accounted for:		48.1%

* p < .05 ** p < .01 *** p < .001

DISCUSSION

Findings from this study indicate that, above and beyond the exercise one gets, various behavioral, psychological, and background factors can be identified as independent correlates of physical fitness. **Behaviors** such as not smoking and the general tendency to engage in "wellness" behaviors but not "preventive/avoidance" behaviors were associated with higher levels of physical fitness. **Psychological** variables such as believing in the importance of physical fitness and expecting to reach and/or maintain one's ideal weight also predicted higher fitness levels. **Background** variables such as age, lower education, not being athletic as a youth, and ever being overweight were related to lower physical fitness. It was of particular interest that exercise activity was more weakly related at both bivariate and multivariate comparison levels than were a number of other behavioral factors, psychological factors related to beliefs about fitness and weight control, and background/demographic factors.

These findings represent a successful attempt to identify factors other than physical exercise per se which are related to physical fitness. Knowledge about such factors might help us structure better interventions and fitness programs tailored to the individual. However, at this point in our knowledge it is not clear the extent to which changing such factors will ultimately lead to changes in physical fitness. Most research to date has been cross-sectional and retrospective, and the inferences we can draw regarding factors which would produce effective interventions are, therefore, limited. Dishman, et al. (1985) present a related discussion pertaining to drawing inferences about factors which might have an impact on changing physical activity levels.

Findings such as those presented in this report do, however, provide ideas about the types of factors which are potentially important to consider when designing interventions to change physical fitness levels. Future research might use such information in conducting quasi-experimental intervention studies to assess the factors which are most effective in producing improvements in physical fitness. Developing causal models to explain how various behavioral, psychological, and background factors interrelate should also prove useful. Understanding how such factors influence each other directly, indirectly, and interactively may help us

structure better interventions and fitness programs which are effective for different types of individuals. Such programs might help people set more realistic goals and, therefore, be more likely to meet personal goals for improving physical fitness.

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Appendix A

Listing of the Items in the Three Health Behaviors Scales

Wellness Behaviors (11 items): alpha = .78

1. I eat a balanced diet.
11. I pray or live by principles of religion.
12. I do things that will improve my health.
14. I watch my weight.
15. I do things to make me a more attractive person.
23. I don't take chemical substances which might injure my health (e.g. food additives, drugs, stimulants).
39. I take vitamins.
45. I discuss health with friends, neighbors, and relatives.
46. I gather information on things that affect my health by watching television and reading books, newspapers, or magazine articles.
49. I brush my teeth regularly.
50. I take health food supplements (e.g. protein additives, wheat germ, bran, lecithin).

Preventive/Avoidance Behaviors (21 items): alpha = .83

2. I get enough sleep.
4. I keep emergency numbers near the phone.
5. I choose my spare time activities to help me relax.
7. I have a first aid kit in my home.
8. I destroy old or unused medicines.
10. I see a doctor for regular checkups.
13. I avoid getting chilled.
17. I watch for possible signs of major health problems (e.g., cancer, hypertension, heart disease).
20. I avoid high crime areas.
22. I do what I can to prevent accidents and illness.
24. I check the condition of electrical appliances, the car, etc. to avoid accidents.
25. I stay away from places where I might be exposed to germs.
27. I fix broken things around my home right away.
29. I see a dentist for regular checkups.
30. I avoid contact with doctors when I am feeling okay.
33. I avoid over working.
35. I limit my intake of foods like coffee, sugar, fats, etc.
44. I avoid areas with high pollution.
47. I use dental floss regularly.
51. I learn first aid techniques.
52. I get shots to prevent illness.

Risk-taking Behaviors (12 items): alpha = .79

3. I participate in physical contact sports.
6. I take chances when crossing the street.
16. I carefully obey traffic rules so I won't have accidents.
19. I cross the street against the stop light.
31. I do things that are exciting and fun even if they are risky.
40. I avoid taking unnecessary chances that might lead to accidents.
41. I do not drink.
43. I cross busy streets in the middle of the block.
48. I speed while driving.
54. I take more chances doing things than the average person.
55. I drink after driving.
56. I engage in activities or hobbies where accidents are possible (e.g. motorcycle riding, skiing, using power tools, sky or skin diving, hang-gliding, etc.).

Appendix B

Zero-Order Correlations between the Physical Fitness Measures and the Behavioral, Psychological, and Background Predictors[a]

	1.5-mi Run	Sit-Ups	Sit-Reach	% Body Fat	Overall Fitness
1.5-mi Run	1.000				
Sit-Ups	-.476	1.000			
Sit-Reach	-.153	.262	1.000		
Percent Body Fat	.325	-.262	-.012	1.000	
Overall Physical Fitness	-.745	.758	.542	-.615	1.000
Exercise Activities	-.279	.354	.185	-.145	.365
Tobacco Use	.312	-.285	-.106	.061	-.290
Alcohol Consumption	-.054	-.018	.006	.010	.009
Caffeine Consumption	.164	-.157	-.093	.009	-.157
Wellness Behaviors	-.193	.336	.170	-.181	.335
Risk-Taking Behaviors	-.143	.164	.104	-.066	.179
Preventive/Avoidance Behaviors[b]	-.003	.105	.069	-.025	.079
Importance of Health	-.226	.291	.222	-.073	.304
Importance of Physical Fitness	-.358	.421	.255	-.109	.431
Importance of Not Smoking	-.216	.213	.112	-.016	.209
Importance of Looking Good	-.257	.249	.186	-.153	.320
Importance of Doing Job Well	.029	.048	.024	-.006	.012
Exercise Leads to Valued Outcomes	-.269	.389	.216	-.085	.363
Expect to Reach/Stay Ideal Weight	-.210	.260	.256	-.161	.331
Expect to Stop/Not Smoke	-.299	.229	.077	-.090	.251
Expect to Exercise Regularly	-.254	.379	.249	-.072	.363
Current Age	.377	-.287	-.141	.225	-.390
Years of Schooling	-.055	.072	-.067	.015	.016
Blood Relative Overweight	.029	.045	-.014	.168	-.067
Ever Overweight	.242	-.127	-.054	.577	-.377
Overweight as a Youth	.105	-.015	.047	.356	-.161
Athletic as a Youth	-.229	.267	.169	-.049	.268

[a] N of cases for these variables ranged from 440 to 1345 because different versions of the lifestyle survey were randomly distributed to participants, and not all variables were included in each version.

[b] This scale is negatively associated with overall physical fitness at the multivariate level. The weak positive association to physical fitness at the bivariate level appears related to this variable's covariance with other "positive" health behaviors. When the overlapping covariance is removed, preventive/avoidance behaviors and physical fitness are negatively related, possibly reflecting the tendency for less fit individuals to avoid the discomfort associated with fitness-oriented activities.

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Achieving higher levels of physical fitness has become a goal of many Americans both for personal reasons (e.g., improved health, appearance, and perceived well-being) and for organizational reasons (e.g., corporate cost-savings with healthy employees; operational readiness for the military services). Understanding the factors which relate to physical fitness could help people improve their fitness levels. This study examined 1,357 Navy men to determine the associations between a variety of behavioral, psychological, and background factors and four components of physical fitness: (a) cardiorespiratory endurance (1.5-mile run), (b) muscular endurance (sit-ups), (c) flexibility (sit-and-reach test), and (d) body composition (estimated percent body fat). After controlling for exercise activities, physical fitness was positively associated with "wellness" behaviors, believing in the importance of physical fitness, expecting to reach/maintain ideal weight, being athletic as a youth, and years of schooling; fitness was negatively associated with tobacco use, "preventive/avoidance" behaviors, age, and ever being overweight. Identifying such factors may help to structure better fitness programs tailored to the individual.

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